Museum Visitor Studies, Evaluation & Audience Research

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View from Space
Remedial Evaluation

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This report presents findings from a remedial evaluation of the *View from Space* exhibit and associated programs conducted by Randi Korn & Associates, Inc. (RK&A), for The Tech Museum of Innovation in San Jose, CA. RK&A conducted 37 unobtrusive observations and 51 interviews with scheduled school groups and drop-in visitors to the *View from Space* exhibit in April and May 2007 to examine visitors' experiences of and reactions to the Global Climate Change presentation, the Global Warming demonstration, and the interactive kiosk.

Selected highlights of the study are included in this summary.
Please consult the body of the report for a detailed account of the findings.

SUCCESSFUL ASPECTS OF VIEW FROM SPACE

GLOBAL CLIMATE CHANGE PRESENTATION

Many interviewees who attended the presentation were impressed by the innovative globe technology and found the imagery compelling, especially the image of the Earth at night. Although many found the information alarming, interviewees were particularly interested in the image depicting predictions of what future world climate temperatures might be if current warming trends continue.

Most interviewees identified the presentation's main idea as showing the effects of climate change, specifically global warming. Some interviewees regarded the *View from Space* presentation as a call to action to do their part to reduce carbon emissions by conserving energy. Some, especially those who had visited the *Green by Design* exhibition before attending the *View from Space* presentation, cited specific conservation actions including using alternate transportation rather than driving cars, planting trees, using energy efficient light bulbs, and unplugging appliances when not in use.

Many interviewees understood the intended relationship between the *View from Space* presentation and the *Green by Design* exhibition and recognized that the former presents environmental problems and the later offers possible solutions to those problems.

VIEW FROM SPACE EXHIBIT KIOSK

Many interviewees said the *View from Space* exhibit was "cool" and praised the dynamic imagery on the globe. Nearly all of the interviewees considered this unusual three-dimensional projection system to be "cutting-edge" technology.

Many interviewees were able to operate the exhibit and understood that the touch screen and trackball control the globe. Most visitor groups experienced one or more of the *View from Space* kiosk recordings, and many of the adult interviewees said the information was straightforward.

Most understood the main idea of the *View from Space* exhibit to be about weather, while others said the exhibit was about the impact of pollution on the Earth's climate. Of those interviewees who had visited *Green by Design*, about one-half said *View from Space* presented the causes of pollution that are affecting climate change and that *Green by Design* offered suggestions on how to reduce that pollution.

GLOBAL WARMING DEMONSTRATION

Interviewees' responses to the demonstration were overwhelmingly positive. Most described the demonstration as "informative," "interactive," and "timely." Nearly all interviewees praised the presenter for his knowledge of the subject and ability to explain complex scientific concepts in an engaging and accessible way to multiple age groups.

Several said the three-dimensional models of the planets and the Sun were excellent tools for helping visitors understand the phenomenon of global warming. Interviewees praised the roll playing aspect of the program as well as the simple demonstrations, which effectively illustrated the chemical makeup of greenhouse gases.

Most interviewees understood the main idea of the demonstration to be about the science of global warming, and some specifically said it was about the greenhouse effect. Interviewees who visited the *View from Space* exhibit or presentation prior to participating in the hands-on demonstration said that the two programs were "well matched" and "complimentary" and that the demonstration did an excellent job explaining the scientific concepts introduced in the *View from Space* presentation.

ASPECTS TO CONSIDER REMEDIATING

While visitors had engaging and educational experiences in the *View from Space* exhibit and associated programs, the evaluation identified logistical, operational, and conceptual aspects of the interpretive offerings to be remediated. Findings that the team should consider addressing are listed below along with recommendations:

GLOBAL CLIMATE CHANGE PRESENTATION

FORMAT AND LOGISITCS

Observations and visitor interviews identified a number of suggestions for improving the format and logistical aspects of the Global Climate Change presentation. Observations found that the presentation format did not take full advantage of the spectacular visual display of the globe projection system, and interviewees recommended showing more images on the globe than the six or seven slides included in the presentation. Moreover, a few interviewees said the presentation was too long and that the presenter spent too much time lecturing with each slide.

- Incorporate more imagery into the presentation. Rather than limiting the presentation to only a handful of slides, consider the presentation to be an interactive slideshow in which the presenter shows multiple images to reinforce the auditory content.

Findings indicate that the quality of the images included in the presentation could be improved. For example, a few interviewees said the image representing glacier recession looked blurry and was dwarfed by the large size of the globe. Moreover, many participants could not see some of the images depending on which side of the gallery they were sitting. In addition, a few interviewees mentioned that it was difficult to recognize what the *View from Space* exhibit was when walking by.

- Include slides in the presentation that are specifically formatted for the three-dimensional globe projection system. Graphs and diagrams included in the current iteration of the presentation appear blurry and difficult to read.

- Display duplicate versions of the graphs and diagrams so that visitors seated on either set of bleacher seats can view the images.

- Add a more prominent graphic panel or title wall to the entrance of the *View from Space* gallery to attract visitors from a distance and serve as an advanced organizer to orient visitors to the space and the interpretive offerings associated with the exhibit.

DELIVERY AND AUDIENCE INTERACTION

Observations and interviews indicated that visitors would have preferred the presentation to be more interactive and for the presenter to do "less talking and more doing" by incorporating hands-on activities into the program. Some school groups suggested making it more "kid-friendly" by incorporating humor, costumes, or fun props. Some others interviewees said the presenter should interact more with the audience. While the observations found that the presenter asked questions, many of the questions were closed rather than open-ended which made the presentation feel more like a lecture than an interactive program.

- Incorporate both hands-on and minds-on interpretive approaches into the presentation. Consider including some of the hands-on elements of the Greenhouse Effect demonstration into the formal Global Climate Change presentation. In addition, consider training staff in inquiry skills, which include asking open-ended questions to facilitate a two-way dialogue between the presenter and the audience.

Many interviewees commented on the way the presenter interacted with the audience. Several said that the presenter asked the audience questions without waiting for them to give a response. Others said the presenter asked participants to guess the correct answer to a question without providing enough information for them to make an informed hypothesis (e.g. "Which country pollutes the most?"). In contrast, a few middle school participants said they found it annoying when the presenter commented that the students "know more about this than I do" and that they felt "silly" and "stupid" when the presenter asked participants to parrot back certain terms such as "fossil fuel" and "greenhouse effect."

- The presenter should carefully consider his or her audience and adjust the tone and delivery of the program accordingly. The findings indicate that the middle school students who participate in the *View from Space* presentation were familiar with topic of global warming, which suggests they were ready to engage in a true inquiry process rather than be superficially quizzed on the topic.

Interviewees offered additional suggestions for the presenter including encouraging him or her to speak more slowly, to move around the gallery rather than lecturing in one stationary spot, and to refer to the specific images on the globe rather than mentioning concepts not visually represented.

CONTENT

Although many of the adult interviewees said most of the information presented was straightforward, many school group interviewees found aspects of the program confusing. Some said that the presenter used big words and did not explain important terms such as "atmosphere," which are critical to understanding the concept of the greenhouse effect. Moreover, some interviewees said they were confused about how the greenhouse effect really works even though the presentation included a diagram illustrating how greenhouse gasses are trapped in the Earth's atmosphere. In contrast, a few interviewees said the presentation was "too basic" and that they already knew a lot of the information presented.

- Gauge the participants' knowledge of the topic at the beginning of the presentation and try to tailor the presentation to serve the needs and interests of a particular audience.

Some interviewees said the Great Pyramid chart was confusing and difficult to read. A few asked what the fingernail represented in relation to that chart. Others interpreted the chart in a literal way and questioned what a pyramid had to do with global warming.

- Consider replacing the Great Pyramid chart representing predications of future global carbon dioxide emissions. Although use of comparison is an effective interpretive devise, the Great Pyramid of Giza did not prove to be a relevant touchstone for middle school student participants.

When asked what the presentation was trying to show, a few school group interviewees said the presentation was about how forest fires are affecting the planet—a message gleaned from the dramatic image included in the presentation of fires burning in Africa as a result of slash-and-burn agricultural methods.

- Consider deemphasizing the visual data of African agricultural fires when presenting the Earth at night image. Although the swath of lights running across the African continent is a dramatic image, in some ways it is a red herring and diverts participants' attention away from the more significant sources of carbon emissions including excessive energy use in industrialized urban areas around the globe.

VIEW FROM SPACE KIOSK

OPERATIONAL

Observations and interviews found that some visitors did not immediately realize that the exhibit had a touchscreen interface or that the trackball controlled the rotation of the globe. Most visitor groups approached the kiosk after the introductory screen timed out, and, therefore, were not able to view the instructional text. Clearly, the kiosk interface was not intuitive to some and they needed the aid of instructional text to help initially engage with the exhibit.

- Reprogram the instructional splash screen not to time out after 90 seconds or consider placing physical labels on the kiosk cabinetry, which instruct visitors to touch the screen to operate the exhibit and to use the trackball to rotate the globe.

Interviewees offered several suggestions for improving the *View from Space* kiosk experience. Several interviewees commented that the text on the kiosk monitor was difficult to read and suggested enlarging the type size. Others commented on the overall environmental design of the *View from Space* gallery and suggested creating a darker theater-like atmosphere in order to make the globe imagery more dramatic. A few adult interviewees with children suggested listing the running time of the presentations. In addition, a few said it was difficult to hear the audio and noted that the speakers are located near the globe rather than above the kiosk.

- Increase the type size of the text on the touchscreen.

- Consider enclosing the *View from Space* gallery to create a theater environment for the globe.

- Add a label indicated the running time of each presentation.

- Consider adding a speaker above the kiosk in addition to the speaker(s) placed near the *View from Space* globe.

CONTENT

When asked what the *View from Space* exhibit was trying to show or tell, most said that the exhibit is about weather. Others offered idiosyncratic answers depending on which of the twelve presentations they selected including "garbage in the ocean," "hurricanes," and "buoys." In addition, one-half of those who had visited *Green by Design* said they did not see a connection between the two exhibit areas because *View from Space* was about weather and space and *Green by Design* was about alternative energy.

- Refine the main message for the *View from Space* and include introductory text on the kiosk that helps frame the exhibit content for visitors through that lens.

Several interviewees—both adults and middle school students—commented that the titles used to indicate the different presentation topics accessed from the kiosk touchscreen were confusing. In addition to the terminology being too advanced for the middle school audience, several adults described the titles as "dry." Others said that the titles did not pique their curiosity to want to learn more about a specific topic.

- Revise the topic headings on the touchscreen menu. Consider adding catchy taglines that might help orient novice visitors to the content and invite them to want to further explore.

GLOBAL WARMING DEMONSTRATION

LOGISTICS

Only three of the ten visitor groups interviewed attended the *View from Space* Global Climate Change presentation or stopped at the kiosk before participating in the demonstration. Interviewees who did not stop at *View from Space* said they were not aware of the presentation option or, if they were engaged in the demonstration, did not want to interrupt the activity to attend a *View from Space* presentation. Others said that the demonstration area drew their attention first, which is not surprising because it was set up by the stairs at the entrance of the lower level of the Museum, and, therefore, blocked the sightline to the *View from Space* gallery.

- Consider staggering the times when the *View from Space* presentation and demonstration are offered.

- Consider relocating the demonstration area to avoid blocking visitors' view of the *View from Space* gallery and clearly posting the daily presentation schedule at the demonstration area to make visitors aware of the associated program.

FORMAT

Although most interviewees referred to the demonstration as interactive and hands-on, interviewees said the demonstration props and materials looked "homemade" and less professional and visually attractive than the stunning, high-tech visual presentation of the *View from Space* globe. In addition, several interviewees said that the demonstration was too long and that there was too much standing. Several interviewees, who had attended the scheduled *View from Space* presentation prior to participating in the demonstration, recommended combining these two programs to best utilize the interpretive strengths of each format.

- Invest in professionally designed and fabricated props and other demonstration materials that fit with the graphic look and feel of the *View from Space* exhibit.

- Consider incorporating the interactive interpretive strategies used in the demonstration (e.g., role-playing scientists in space and the "greenhouse gas jiggle" tennis ball demonstration) into the formal Global Climate Change presentation, rather than having these two interpretive offerings compete. Also, doing the hands-on demonstration activities in the *View from Space* gallery where there is seating would address visitors' concerns about the program length and lack of seating.

OPERATIONAL

Interviewees commented that the heat lamp used to represent Mercury's proximity to the Sun was too hot, and, therefore, dangerous to the touch.

- Consider adding heat a shield or alternate light source to the solar system model used in the demonstration.

CONTENT

A few interviewees commented that the demonstration explained the science of global warming but did not address actions people can take to mitigate the problem.

- Consider having the presenter wrap up the demonstration with a Q&A session, which addresses actions visitors can take to conserve energy.

This report presents findings from a remedial evaluation of the *View from Space* exhibit and associated programs conducted by Randi Korn & Associates, Inc. (RK&A), for The Tech Museum of Innovation in San Jose, CA. Data were collected three days (two weekdays and one weekend day) in April and May 2007.

Remedial evaluations are conducted to help improve an exhibition, exhibit or program. The goal is to identify and analyze any shortcomings (e.g., logistical, operational, and conceptual) so that the museum offerings can be modified to be as effective as possible. For this remedial evaluation, RK&A examined three aspects of *View from Space*: the Global Climate Change presentation offered by museum staff, the interactive kiosk used to operate the *View from Space* globe, and the Global Warming demonstration facilitated by a volunteer from the Lawrence Hall of Science. The specific objectives for each component of the *View from Space* remedial evaluation are listed below.

The objectives of the Global Climate Change presentation evaluation were to examine:

- Visitors' opinions of the presentation;
- The ability of the presenter to capture and retain visitors' attention;
- The interactive nature of the presentation and quality of interactions between the presenter and visitors;
- Ideas and concepts visitors take away from the presentation;
- Understanding of main messages (as stated in the presentation content outline); and
- Whether visitors make a connection between the presentation and the GBD exhibition.

The objectives of the *View from Space* kiosk evaluation were to examine:

- Visitors' opinions of the kiosk and globe;
- Visitors' use of the kiosk and globe (Do they explore multiple images on the globe?);
- The ability of visitors to use the kiosk as designers intended (Do they realize the kiosk is used to control the globe?);
- Whether visitors consider *View from Space* a "cutting-edge exhibit;" and
- Ideas and concepts visitors take away from the kiosk and globe.

The objectives of the facilitated Global Warming demonstration evaluation were to examine:

- Visitors' opinions of the demonstration;

- The ability of the presenter to capture and retain visitors' attention;
- The interactive nature of the demonstration and quality of interactions between the presenter and visitors;
- Ideas and concepts visitors take away from the presentation;
- Visitors' understanding of demonstration's main messages; and
- Whether visitors make a connection between the demonstration and the *View from Space* globe and kiosk.

METHODOLOGY

To understand the visitor experience with the *View from Space* exhibit and programs, RK&A conducted uncued observations and interviews. RK&A unobtrusively observed English-speaking visitors—both school groups (sixth-grade students with written parental permission, chaperones, and one teacher) and drop-in visitors age 12 or older and noted their behaviors. When a group finished using the exhibit or participating in the programs, the evaluator approached and interviewed visitors about their experiences (see the Appendices for interview guides). As an incentive to complete an interview, interviewees were offered two vouchers to attend an IMAX film at the Museum.

DATA ANALYSIS AND REPORTING METHOD

The data are qualitative, meaning that results are descriptive, following from the nature of observations and interviews. In analyzing the data, the evaluator studied behaviors and responses for meaningful patterns and, as patterns and trends emerged, grouped similar behaviors and responses. Trends and themes in the data are presented from most- to least-frequently occurring.

FINDINGS IN THIS REPORT ARE PRESENTED IN THREE MAIN SECTIONS:

Global Climate Change Presentation

View from Space Kiosk

Global Warming Demonstration

PRINCIPAL FINDINGS: GLOBAL CLIMATE CHANGE PRESENTATION

The *View from Space* Global Climate Change presentation is a brief (approximately 15-minute) facilitated slide show, which features the *Science on a Sphere* three-dimensional projection system developed by the National Oceanic Atmospheric Administration (NOAA). The presentation was written and presented by staff of The Tech Museum. Two staff members facilitated the presentation during the *View from Space* remedial evaluation—one presented on weekdays to school groups and drop-in visitors and the other presented on weekends to drop-in visitors only. The data were collected on two weekdays and one weekend day, and the presentation was offered five to seven times throughout the day at scheduled times.

VISITOR CHARACTERISTICS

RK&A observed 16 visitor groups and interviewed 29 visitor groups (16 middle school groups with secured parental consent and 13 drop-in visitor groups) comprised of 99 visitors (50 adults and 49 children). One-half of interviewees were male and one-half were female (51 percent and 49 percent, respectively). Adults ranged in age from 18 to 66 years of age, with a median age of 41 years. Children ranged in age from 4 to 14 years of age, with a median age of 12 years.

Two-thirds of interviewees were repeat visitors while one-third were visiting the Museum for the first time (63 percent and 37 percent, respectively). Of the 62 repeat visitors, 33 had visited the Museum one to two times in the last year, 19 had visited three to four times, and 10 had visited five to six times in the same time period.

RESPONSES TO THE PRESENTATION

OVERALL OPINION

Although many interviewees' overall opinion was that the presentation was "good" and "cool," some school group interviewees described the presentation as "boring" because there was "too much talking." Similarly, some interviewees said the presentation was "too passive" and that the presenter should have asked more questions to make the format more interactive. Several interviewees described the presentation as "informative." In contrast, a few interviewees said the presentation was "too basic" and that they already knew a lot of the information presented.

When asked if they would tell a friend about the presentation, all but two interviewees said yes. Most said they would tell their friends to see the "cool globe." Some said they would relate to friends the message that global warming is "causing a lot of problems." A few said they would tell a friend that the presentation was "educational." Two interviewees—both middle school students—said they would not recommend the *View from Space* Global Climate Change presentation to a friend because, again, they thought it was uninteresting.

MOST AND LEAST ENJOYABLE ASPECTS

When asked what they liked the most about the presentation, nearly all participants cited the innovative globe technology. Many said the visual presentation was appealing, especially the image of the Earth at

night, which included a dramatic image of agricultural fires in Africa. Some interviewees were particularly interested in and alarmed by the image that modeled predications of what future temperatures around the world might be if current warming trends continue. Another notable image was the chart that compared the Great Pyramid of Giza with projected carbon dioxide emissions. Although some said the use of the Great Pyramid as a reference point was confusing, others said the message about carbon dioxide pollution was "thought provoking" and "scary."

The evaluator asked interviewees what problems, if any, they had with the way the information was presented. Many interviewees did not identify any problems. However, some said it was difficult to understand the presentation because the presenter spoke too quickly and the microphone was too loud. Some complained that the presenter's position in front of the globe blocked their view of the Southern Hemisphere on the world map. A few said the presentation was too long and that the presenter spent too much time lecturing with each slide. One interviewee said it was distracting to have the presenter interrupt what he was saying in order to change the slide with the remote control.

Some interviewees' commented on the way the presenter interacted with the audience. Several said that the presenter asked the audience questions without waiting for them to give a response. A few interviewees said that the presenter asked participants to guess the correct answer to a question without providing enough information for them to make an informed hypothesis (e.g. "Which country pollutes the most?"). In contrast, a few middle school participants said they found it annoying when the presenter commented several times during the presentation that the students "know more about this than I do." Similarly, two school group interviewees commented that they felt "silly" and "stupid" when the presenter asked participants to parrot back certain terms such as "fossil fuel" and "greenhouse effect."

Although many of the adult interviewees said most of the information presented was straightforward, many school group interviewees found aspects of the program confusing. Some said that the presenter used big words and did not explain important terms such as "atmosphere," which are critical to understanding the concept of the greenhouse effect. Moreover, some interviewees said they were confused about how the greenhouse effect really works even though the presentation included a diagram illustrating how greenhouse gasses are trapped in the Earth's atmosphere. In addition, a few said the presenter did not explain the connection between hurricanes and global warming and were confused when the presenter seemingly digressed from the climate change topic to talk about hurricanes.

As mentioned above, some interviewees said the Great Pyramid chart was confusing and difficult to read. A few asked what the fingernail represented in relation to that chart. Others interpreted the chart in a literal way and questioned what a pyramid had to do with global warming. A few interviewees said the image representing glacier recession looked blurry and was dwarfed by the large size of the globe.

VISITOR RECOMMENDATIONS

Interviewees offered a range of suggestions for improving the format, tone, and content of the *View from Space* Global Climate Change presentation. Many interviewees recommended making the presentation more interactive. Some said the presenter should ask the audience more questions. Others suggested the presenter do "less talking and more doing" by incorporating hands-on activities into the program. In regard to the tone of the presentation, some school group interviewees suggested making it more "kid-friendly" by not using "such big words" and incorporating humor, costumes, or fun props.

Some interviewees recommended showing more images on the globe than the six or seven slides included in the presentation. Moreover, some interviewees suggested improving the quality of the images by enlarging the size of the charts and diagrams, making the text less blurry, and ensuring that

the images can be seen from both sides of the bleacher seating. Others suggested adjusting the sound quality so that the presenter could be better understood.

Interviewees offered several suggestions about the presenter including encouraging him or her to speak more slowly, to move around the gallery rather than lecturing in one stationary spot, and to refer to the specific images on the globe rather than mentioning concepts not visually represented. In addition, several adult interviewees suggested that the presenter repeat participants' questions aloud and make more specific suggestions on how to combat global warming rather than simply say "use less energy" and "be informed [about the issue]."

In addition, a few interviewees, all drop-in visitors, mentioned that it was difficult to recognize what the *View from Space* exhibit was when walking by. Interviewees suggested placing a more prominent sign at the entrance to the gallery to help orient visitors and invite them into the space.

UNDERSTANDING OF PRESENTATION CONTENT

VISITOR PERCEPTIONS OF THE PRESENTATION'S MAIN IDEA

When asked what the presentation was trying to show, many interviewees said it was about global warming and climate change. Some answered the question more generally and said the presentation was trying to tell people to stop polluting by conserving energy. A few school group interviewees said the presentation was trying to show that humans are destroying the planet. In contrast, a few others offered a more optimistic perspective and said the main message of the presentation was that it is not too late to stop global warming. A couple of school group interviewees said the presentation was about how forest fires are affecting the planet—a message gleaned from the dramatic image included in the presentation of fires burning in Africa as a result of slash-and-burn agricultural methods.

REACTIONS TO ENVIRONMENTAL MESSAGES

The evaluators asked interviewees how it made them feel when the presenter was talking about the environmental issues. Interviewees cited a range of emotions: Many said they were "sad" and "upset" about the affects of global warming and gave specific examples such as polar bears in the Arctic dying. Some said they were "depressed" and "ashamed" that humans are "destroying the planet" and that "we're not doing much about it." In contrast, some interviewees regarded the *View from Space* presentation as a call to action to do their part to try and combat climate change and reduce carbon emissions. A few interviewees said that they were angry at "the powers that be" and "corporate greed" for polluting and fueling the climate change crisis.

All but one of the interviewees said they had thought about these environmental issues before attending the presentation. Most remarked that there has been a lot of coverage on global warming in the news recently. Many interviewees—both adult and school children—said that they had seen the film *An Inconvenient Truth* in which former Vice President Al Gore addresses the climate change crisis. Many of the school group interviewees said they had been studying these environmental science topics in school, and some said they were doing service learning projects focused on global warming issues including planting trees, selling cloth bags for groceries and LED lights , and writing articles for their school newspapers. One middle school teacher interviewed said that climate change had been a central theme in her class curriculum that year.

When asked what they think they can do about the environmental issues presented in the *View from Space* program, many interviewees said, "use less energy" and "stop polluting." Some, especially those who

had visited the *Green by Design* exhibition before attending the *View from Space* presentation, cited specific actions including using alternate transportation rather than driving cars, planting trees, using LED and "curly-Q [compact fluorescent]" light bulbs, and unplugging appliances when not in use. A few interviewees responded with general environmental actions including "pick up trash" and "recycle." When probed about the connection between picking up trash and global warming, interviewees said that is what people do when they want to "save the planet."

CONNECTION BETWEEN VIEW FROM SPACE AND THE GREEN BY DESIGN EXHIBITION

About two-thirds of interviewees had visited the *Green by Design* exhibit before they attended the *View from Space* presentation. The evaluators asked those interviewees to describe how the *View from Space* exhibit relates to the *Green by Design* exhibition. Most said *Green by Design* is about alternative energy and energy conservation and that *View from Space* is about global warming and climate change. Some said that the *View from Space* presentation presents environmental problems and that the *Green by Design* exhibition offers possible solutions to those problems.

The interactive kiosk allows visitors to operate the *View from Space* exhibit at times between the scheduled facilitated presentations. As visitors approach the kiosk, they encounter either an introductory screen inviting them to "touch the screen to begin" or a menu screen listing 12 topics. Once a topic is selected, images are projected on the globe accompanied by a 90-second audio recording and closed-caption text on the screen. The exhibit interface offers visitors the option to select a Spanish translation of the exhibit text.

VISITOR CHARACTERISTICS

RK&A observed and interviewed 12 visitor groups (six drop-in visitor groups and four middle school groups with secured parental consent) comprised of 29 visitors (14 adults and 15 children). Slightly more than one-half of interviewees were male and slightly less than one-half were female (55 percent and 45 percent, respectively). Adults ranged in age from 23 to 61 years of age, with a median age of 42 years. Children ranged in age from 5 to 14 years of age, with a median age of 12 years. Four of the ten groups were middle students visiting with their school class.

Two-thirds of the visitor groups were repeat visitors while one-third were visiting the Museum for the first time (66 percent and 34 percent, respectively). Of eight repeat visitors, four had visited the Museum one time, two had visited two times, and one had visit four times in the past year.

RESPONSES TO THE EXHIBIT

OVERALL OPINION

Interviewees' overall opinions of the *View from Space* exhibit were positive. Most referred to the exhibit as "cool" while others described the globe as "stunning" and "colorful." When asked what associations they had with the term "cutting-edge," most said "high-tech" or "innovative and interactive" came to mind. Interviewees categorized the *View from Space* globe as cutting-edge because of its unusual projection system and sophisticated imagery. Nearly all interviewees said that they would tell a friend about the exhibit and recommend visiting The Tech specifically to see the globe.

MOST AND LEAST ENJOYABLE ASPECTS

The evaluator asked interviewees what they liked most about the *View from Space* exhibit. Nearly all interviewees cited the visual display on the three-dimensional globe. A few said they enjoyed playing with the trackball to rotate the globe. In contrast, a few interviewees said the trackball interface was disorienting. Their opinion was that visitors should not be given the option to rotate the globe so as not to interfere with others' view of the exhibit. In addition, a few said it was difficult to hear the audio and noted that the speakers are located near the globe rather than above the kiosk.

USE OF THE KIOSK INTERFACE

All but one observed visitor group experienced one or more of the *View from Space* kiosk recordings. Although most observed and interviewed visitors understood to use the touchscreen to operate the *View from Space* globe, some interviewees said the touchscreen interface was not "user-friendly." All but two of the observed visitor groups approached the kiosk after the introductory screen timed out, and, therefore, were not able to view the instructional text. As a result, some interviewees suggested adding

instructional text to the kiosk prompting visitors to touch the screen to operate the exhibit. Moreover, some interviewees said that it was not readily apparent to use the trackball to rotate the globe and that the kiosk should be clearly labeled with instructions to do so.

VISITOR RECOMMENDATIONS

When asked to make suggestions for improving the *View from Space* exhibit, some recommended redesigning the sound system to improve the volume and quality of the sound. Others commented on the overall environmental design of the *View from Space* gallery and suggested creating a darker theater-like atmosphere in order to make the globe imagery more dramatic. One interviewee suggested playing soft classical music in the background to help slow visitors down and add "atmosphere" to the *View from Space* gallery.

As noted above, some interviewees suggested including clearly visible instructions on the kiosk. Several interviewees commented that the touchscreen text was difficult to read and suggested enlarging the type. In addition, a few parents suggested listing the running time of the presentations.

UNDERSTANDING EXHIBIT CONTENT

LANGUAGE ACCESSIBILITY

Although many of the adult interviewees said they did not find anything about the information presented in the *View from Space* exhibit confusing, many of the school group interviewees indicated that the scientific terminology and information was too advanced for a younger audience. As one interviewee said, "I didn't know what some of the words were. I'm not a good reader."

Several interviewees—both adults and middle school students—commented that the titles used to indicate the different presentation topics accessed from the kiosk touchscreen were confusing. In addition to the terminology being too advanced for the middle school audience, several adults described the titles as "dry." Others said that the titles did not pique their curiosity to want learn more about a specific topic.

VISITOR PERCEPTIONS OF THE EXHIBIT'S MAIN IDEA

When asked what the *View from Space* exhibit was trying to show or tell, most said that the exhibit is about weather. More specifically, some said that the exhibit is about the Earth's atmosphere. A few said the exhibit was about the impact of pollution on the Earth's climate. A few said the exhibit was trying to show what the Earth looks like from space. Others offered idiosyncratic answers depending on which of the twelve presentations they selected including "garbage in the ocean," hurricanes," and "buoys." A few interviewees confessed that they were so focused on the visual effects of the globe projection system and how it works that they did not pay attention to the information conveyed in the presentation they selected.

CONNECTION BETWEEN VIEW FROM SPACE AND THE GREEN BY DESIGN EXHIBITION

Slightly more than one-half of the interviewees had visited the *Green by Design* exhibition prior to their visit to *View from Space*. The evaluator asked what connection there was between the *View from Space* exhibit and the exhibits in *Green by Design*. Of those interviewees who had visited *Green by Design*, about one-half said *View from Space* presented the causes of pollution that are affecting climate change and that *Green by Design* offered suggestions on how to reduce that pollution. Conversely, one-half of those who had visited *Green by Design* said they did not see a connection between the two exhibit areas because *View from Space* was about weather and space and *Green by Design* was about alternative energy.

To compliment the *View from Space* presentation and exhibit experiences with additional global climate change content, The Tech partnered with Climate Change Education, a not-for-profit organization that volunteers with San Francisco Bay Area museums. On a Sunday in May 2007, a volunteer from the Lawrence Hall of Science set up the Climate Change Education literature, handouts and demonstration materials in an area on the lower level of the Museum in front of *View from Space*. RK&A observed visitors who stopped at the demonstration and interviewed them after completing the informal drop-in program.

VISITOR CHARACTERISTICS

RK&A observed and interviewed 10 drop-in visitor groups comprised of 28 visitors (13 adults and 15 children). Two-thirds of interviewees were male and one-third were female (70 percent and 30 percent, respectively). Adults ranged in age from 24 to 59 years of age, with a median age of 43 years. Children ranged in age from 6 to 14 years of age, with a median age of 11 years.

Two-thirds of the visitor groups were repeat visitors while one-third were visiting the Museum for the first time (66 percent and 34 percent, respectively). Of seven repeat visitors, three had visited the Museum one time, two had visited six times, one had visited ten times, and one had visited fours times in the past year.

RESPONSES TO THE DEMONSTRATION

OVERALL OPINION

Interviewees' responses to the demonstration were overwhelming positive. Most described the demonstration as "informative" and noted that much of the information they learned about the greenhouse effect was either new to them or that presenter helped them truly understand the concepts for the very first time. Many said the presenter was "excellent." Some praised the interactive nature of the program and described the demonstration as "hands-on," while others praised the timeliness of the topic given the current global climate change crisis.

When asked if they would tell a friend about the demonstration, all interviewees said yes. Most said they would recommend it to others because, again, the presenter was "excellent" and the demonstration was "informative."

MOST AND LEAST ENJOYABLE ASPECTS

Nearly all interviewees said the skilled presenter was the most enjoyable aspect of the demonstration. Many described the presenter as "knowledgeable" and "patient." Some said that the presenter was good at addressing multiple age groups and explaining complex scientific concepts such as the Earth's atmosphere to children. Some said the presenter made the demonstration interactive by skillfully asking visitors questions. Several said the three-dimensional models of the planets and the Sun were excellent teaching tools and helped them put the phenomenon of global warming in the context of the entire solar system. A few parents praised the role-playing aspect of the presentation, and a few children said

they enjoyed pretending to be a scientist traveling in space. A few interviewees said the "greenhouse gas jiggle" demonstration, which used tennis balls to represent carbon dioxide molecules, as a highly effective way to convey information about the greenhouse effect.

When asked what they least enjoyed about the Global Warming demonstration, many interviewees said they did not have a least favorite aspect. However, several said that the demonstration was too long and that the presenter needed to go through the material more quickly. Similarly, a few interviewees, all parents, said there was too much standing and that their children grew "antsy" towards the end of the program. Although they praised the demonstration content and facilitation, a few interviewees commented that the posters, models, and other visual aids looked "homemade" and were not as professionally produced and realistic as other interpretive elements in the Museum. Two interviewees complained that the heat lamp used to represent Mercury's proximity to the Sun was too hot, and, therefore, dangerous to the touch.

VISITOR RECOMMENDATIONS

When asked what suggestions they had for improving the Global Warming demonstration, many interviewees did not make any recommendations. Some suggested shortening the length of the program. Several interviewees who had attended the scheduled *View from Space* presentation prior to participating in the demonstration, recommended incorporating the demonstration activities and interpretive strategies into the formal Global Climate Change presentation. These interviewees said the presentation lacked hands-on activities and that the demonstration lacked the stunning, high-tech visual aid of the globe. By combining these two programs, the interpretive strengths of each could be best utilized.

UNDERSTANDING DEMONSTRATION CONTENT

VISITOR PERCEPTIONS OF THE DEMONSTRATION'S MAIN IDEA

Most interviewees who participated in the demonstration said its main idea is about global warming. Some said more specifically that the demonstration was about the greenhouse effect. A few interviewees commented that the demonstration explained the science of global warming but did not address actions people can take to mitigate the problem. A few children who appeared to not grasp the intended big idea gave idiosyncratic answers including that the demonstration was about understanding the distance from the Earth to the Sun or that it would be difficult to travel to other planets.

CONNECTION BETWEEN THE DEMONSTRATION AND THE *VIEW FROM SPACE* EXHIBIT

Only three of the ten visitor groups interviewed attended the *View from Space* Global Climate Change presentation or stopped at the kiosk before participating in the demonstration. Interviewees who did not stop at *View from Space* said they either were not aware of the presentation option or that they stopped at the demonstration area first because it drew their attention more than the *View from Space* area. When asked to describe the connection between the demonstration and the *View from Space* presentation or kiosk, those who had visited *View from Space* said that the two programs were "well matched" and "complimentary." Some interviewees said that the globe provided a good introduction to the issues of climate change but that the demonstration was more interactive and hands-on and did a better job at explaining the science of global warming and the greenhouse effect than the presentation. However, a few interviewees said they found the names of the chemicals and gases referred to in the demonstration confusing.

APPENDIX A

VIEW FROM SPACE GLOBAL CLIMATE CHANGE PRESENTATION INTERVIEW GUIDE

Protocol: RK&A will observe visitors during the presentation and take notes about their behaviors. At the conclusion of the presentation, RK&A will intercept visitors and interview them. English-speaking visitors ages 12 years and older are the target audience for the evaluation. Both school groups (for which we have permission) and drop-in visitors will be included in the sample.

Preamble: Hi, I'm talking with visitors today about the presentation you just attended. It will only take a few minutes and your input would be very helpful. [If additional incentive needed] Plus, as a thank you gift I have IMAX/Galleries tickets for visitors who complete the interview.

1. Overall, what was your opinion about the presentation you just attended? [Point to *View from Space*]

2. What about this presentation did you like most? Why is that?

3. What about this presentation did you like least? Why is that?

   [Probe] What problems, if any, did you have with the way the information was presented?
   [Probe] What, if anything, was confusing about the information?

4. What would you say this presentation was trying to show or tell visitors? [Probe] What was the main idea of this presentation?

5. When the presenter was talking about the environmental issues, how did that make you feel?
   [Probe:] Had you thought about these environmental issues before? [If yes] How so?
   [Probe:] What do you think you could do about these issues?

6. Did you happen to visit the exhibits over there [Point to *Green by Design*]?

   [If yes] What connection, if any, do you think there is between the presentation and those exhibits?

7. What suggestions do you have for improving this presentation? Anything else you'd like to say about this presentation?

8. Would you tell a friend about this presentation? [If yes] What would you say about it?

Thank you so much for your input. I have a few final demographic questions: Is this your first visit to The Tech Museum? [If no] How many times in the past 12 months have you visited The Tech? Do you mind if I ask your age? [Also record gender]

APPENDIX B

VIEW FROM SPACE EXHIBIT KIOSK INTERVIEW GUIDE

Protocol: RK&A will observe visitors using the kiosk and take notes about their behaviors. Then RK&A will interview the visitors. English-speaking visitors ages 12 years and older are the target audience for the evaluation. Both school groups (for which we have permission) and drop-in visitors will be included in the sample.

Preamble: Hi, I'm talking with visitors today about this exhibit. It will only take a few minutes and your input would be very helpful. [If additional incentive needed] Plus, as a thank you gift I have IMAX/Galleries tickets for visitors who complete the interview.

1. Overall, what was your opinion about this exhibit?

2. What about this exhibit did you like most? Why is that?

3. What about this exhibit did you like least? Why is that?

   [Probe] What problems, if any, did you have using this exhibit?
   [Probe] What, if anything, was confusing about the on-screen instructions?
   [Probe] What, if anything, was confusing about the information presented in this exhibit?

4. What connection, if any, is there between this exhibit and the big globe? [Probe:] How does what you're seeing on the screen here relate to what's happening on the globe?

5. What would you say this exhibit was trying to show or tell visitors? [Probe:] What was the main idea of this exhibit?

6. Did you happen to visit the exhibits over there [point to *Green by Design*]?

   [If yes] What connection, if any, do you think there is between this exhibit and the exhibits over there?

   [If yes] What would you say those exhibits [point to *Green by Design*] are about?

7. One of The Tech's goals is to provide visitors with cutting-edge exhibits. When I say "cutting-edge exhibits" what comes to mind? Of the exhibits you used in this area [point to View from Space and *Green by Design*], which, if any, would you describe as cutting edge? Why do you consider (that one/those) cutting edge?

8. What suggestions do you have for improving this exhibit? Anything else you'd like to say about this exhibit?

9. Would you tell a friend about this exhibit? [If yes] What would you say about it?

Thank you so much for your input. I have a few final demographic questions: Is this your first visit to The Tech Museum? [If no] How many times in the past 12 months have you visited The Tech? Do you mind if I ask your age? [Also record gender]

APPENDIX C

VIEW FROM SPACE GLOBAL WARMING FACILITATED DEMONSTRATION INTERVIEW GUIDE

Protocol: RK&A will observe visitors doing the hands-on activity and take notes about their behaviors. Then RK&A will interview the visitors. English-speaking visitors ages 12 years and older are the target audience for the evaluation. Drop-in visitors will be included in the sample.

Preamble: Hi, I'm talking with visitors today about this activity. It will only take a few minutes and your input would be very helpful. [If additional incentive needed] Plus, as a thank you gift I have IMAX/Galleries tickets for visitors who complete the interview.

1. Overall, what was your opinion about this activity?

2. What about this activity did you like most? Why is that?

3. What about this activity did you like least? Why is that?

   [Probe] What problems, if any, did you have doing this activity?
   [Probe] What, if anything, was confusing about the information presented in this activity?

4. What would you say this activity was trying to show or tell visitors? [Probe: What was the main idea of this activity?]

5. Did you happen to visit the kiosk and big globe over there [Point to *View from Space*]?

   [If yes] What connection, if any, do you think there is between this activity and the kiosk and big globe?

6. What suggestions do you have for improving this activity? Anything else you'd like to say about this activity?

7. Would you tell a friend about this activity? [If yes] What would you say about it?

Thank you so much for your input. I have a few final demographic questions: Is this your first visit to The Tech Museum? [If no] How many times in the past 12 months have you visited The Tech? Do you mind if I ask your age? [Also record gender.]